SEQUENCE LISTING

<110> National Institutes of Health
Qasba, Pradman
Boeggeman, Elizabeth
Ramakrishnan, Boopathy

<120> Catalytic Domains Of Beta(1,4)-Galactosyltransferase I Having Altered Metal Ion Specificity

<130> 1662.027WO1

<160> 13

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<213> Homo sapiens

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<210> 2
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<212> PRT
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<400> 4

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His Leu Gly Val Thr Leu Val Tyr Tyr Leu Ala Gly Arg Asp Leu Ser
        35                  40                  45
Arg Leu Pro Gln Leu Val Gly Val Ser Thr Pro Leu Gln Gly Gly Ser
    50                  55                  60
Asn Ser Ala Ala Ala Ile Gly Gln Ser Ser Gly Asp Leu Arg Thr Gly
65                  70                  75                  80
Gly Ala Arg Pro Pro Pro Pro Leu Gly Ala Ser Ser Gln Pro Arg Pro
                85                  90                  95
Gly Gly Asp Ser Ser Pro Val Val Asp Ser Gly Pro Gly Pro Ala Ser
            100                 105                 110
Asn Leu Thr Ser Val Pro Val Pro His Thr Thr Ala Leu Ser Leu Pro
        115                 120                 125
Ala Cys Pro Glu Glu Ser Pro Leu Leu Val Gly Pro Met Leu Ile Glu
    130                 135                 140
Phe Asn Met Pro Val Asp Leu Glu Leu Val Ala Lys Gln Asn Pro Asn
145                 150                 155                 160
Val Lys Met Gly Gly Arg Tyr Ala Pro Arg Asp Cys Val Ser Pro His
                165                 170                 175
Lys Val Ala Ile Ile Ile Pro Phe Arg Asn Arg Gln Glu His Leu Lys
            180                 185                 190
Tyr Trp Leu Tyr Tyr Leu His Pro Val Leu Gln Arg Gln Gln Leu Asp
        195                 200                 205
Tyr Gly Ile Tyr Val Ile Asn Gln Ala Gly Asp Thr Ile Phe Asn Arg
    210                 215                 220
Ala Lys Leu Leu Asn Val Gly Phe Gln Glu Ala Leu Lys Asp Tyr Asp
225                 230                 235                 240
Tyr Thr Cys Phe Val Phe Ser Asp Val Asp Leu Ile Pro Met Asn Asp
                245                 250                 255
His Asn Ala Tyr Arg Cys Phe Ser Gln Pro Arg His Ile Ser Val Ala
            260                 265                 270
Met Asp Lys Phe Gly Phe Ser Leu Pro Tyr Val Gln Tyr Phe Gly Gly
        275                 280                 285
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Val Ser Ala Ser Ser Lys Gln Gln Phe Leu Thr Ile Asn Gly Phe Pro
290 295 300
Asn Asn Tyr Trp Gly Trp Gly Gly Glu Asp Asp Asp Ile Phe Asn Arg
305 310 315 320
Leu Val Phe Arg Gly Met Ser Ile Ser Arg Pro Asn Ala Val Val Gly
325 330 335
Thr Cys Arg Met Ile Arg His Ser Arg Asp Lys Lys Asn Glu Pro Asn
340 345 350
Pro Gln Arg Phe Asp Arg Ile Ala His Thr Lys Glu Thr Met Leu Ser
355 360 365
Asp Gly Leu Asn Ser Leu Thr Tyr Gln Val Leu Asp Val Gln Arg Tyr
370 375 380
Pro Leu Tyr Thr Gln Ile Thr Val Asp Ile Gly Thr Pro Ser
385 390 395

<210> 5
<211> 399
<212> PRT
<213> Mus musculus

<400> 5
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Ala Thr Leu Gln Arg Ala Cys Arg Leu Leu Val Ala Val Cys Ala Leu
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His Leu Gly Val Thr Leu Val Tyr Tyr Leu Ser Gly Arg Asp Leu Ser
35 40 45
Arg Leu Pro Gln Leu Val Gly Val Ser Ser Thr Leu Gln Gly Gly Thr
50 55 60
Asn Gly Ala Ala Ala Ser Lys Gln Pro Pro Gly Glu Gln Arg Pro Arg
65 70 75 80
Gly Ala Arg Pro Pro Pro Pro Leu Gly Val Ser Pro Lys Pro Arg Pro
85 90 95
Gly Leu Asp Ser Ser Pro Gly Ala Ala Ser Gly Pro Gly Leu Lys Ser
100 105 110
Asn Leu Ser Ser Leu Pro Val Pro Thr Thr Thr Gly Leu Leu Ser Leu
115 120 125
Pro Ala Cys Pro Glu Glu Ser Pro Leu Leu Val Gly Pro Met Leu Ile
130 135 140
Asp Phe Asn Ile Ala Val Asp Leu Glu Leu Leu Ala Lys Lys Asn Pro
145 150 155 160

Glu Ile Lys Thr Gly Gly Arg Tyr Ser Pro Lys Asp Cys Val Ser Pro
165 170 175
His Lys Val Ala Ile Ile Ile Pro Phe Arg Asn Arg Gln Glu His Leu
180 185 190
Lys Tyr Trp Leu Tyr Tyr Leu His Pro Ile Leu Gln Arg Gln Gln Leu
195 200 205
Asp Tyr Gly Ile Tyr Val Ile Asn Gln Ala Gly Asp Thr Met Phe Asn
210 215 220
Arg Ala Lys Leu Leu Asn Ile Gly Phe Gln Glu Ala Leu Lys Asp Tyr
225 230 235 240
Asp Tyr Asn Cys Phe Val Phe Ser Asp Val Asp Leu Ile Pro Met Asp
245 250 255
Asp Arg Asn Ala Tyr Arg Cys Phe Ser Gln Pro Arg His Ile Ser Val
260 265 270
Ala Met Asp Lys Phe Gly Phe Ser Leu Pro Tyr Val Gln Tyr Phe Gly
275 280 285
Gly Val Ser Ala Leu Ser Lys Gln Gln Phe Leu Ala Ile Asn Gly Phe
290 295 300
Pro Asn Asn Tyr Trp Gly Trp Gly Gly Glu Asp Asp Asp Ile Phe Asn
305 310 315 320
Arg Leu Val His Lys Gly Met Ser Ile Ser Arg Pro Asn Ala Val Val
325 330 335
Gly Arg Cys Arg Met Ile Arg His Ser Arg Asp Lys Lys Asn Glu Pro
340 345 350
Asn Pro Gln Arg Phe Asp Arg Ile Ala His Thr Lys Glu Thr Met Arg
355 360 365
Phe Asp Gly Leu Asn Ser Leu Thr Tyr Lys Val Leu Asp Val Gln Arg
370 375 380
Tyr Pro Leu Tyr Thr Gln Ile Thr Val Asp Ile Gly Thr Pro Arg
385 390 395

<210> 6
<211> 402
<212> PRT
<213> Bos taurus

<400> 6
Met Lys Phe Arg Glu Pro Leu Leu Gly Gly Ser Ala Ala Met Pro Gly
1 5 10 15
Ala Ser Leu Gln Arg Ala Cys Arg Leu Leu Val Ala Val Cys Ala Leu
20 25 30

His Leu Gly Val Thr Leu Val Tyr Tyr Leu Ala Gly Arg Asp Leu Arg
35 40 45
Arg Leu Pro Gln Leu Val Gly Val His Pro Pro Leu Gln Gly Ser Ser
50 55 60
His Gly Ala Ala Ala Ile Gly Gln Pro Ser Gly Glu Leu Arg Leu Arg
65 70 75 80
Gly Val Ala Pro Pro Pro Pro Leu Gln Asn Ser Ser Lys Pro Arg Ser
85 90 95
Arg Ala Pro Ser Asn Leu Asp Ala Tyr Ser His Pro Gly Pro Gly Pro
100 105 110
Gly Pro Gly Ser Asn Leu Thr Ser Ala Pro Val Pro Ser Thr Thr Thr
115 120 125
Arg Ser Leu Thr Ala Cys Pro Glu Glu Ser Pro Leu Leu Val Gly Pro
130 135 140
Met Leu Ile Glu Phe Asn Ile Pro Val Asp Leu Lys Leu Ile Glu Gln
145 150 155 160
Gln Asn Pro Lys Val Lys Leu Gly Gly Arg Tyr Thr Pro Met Asp Cys
165 170 175
Ile Ser Pro His Lys Val Ala Ile Ile Ile Leu Phe Arg Asn Arg Gln
180 185 190
Glu His Leu Lys Tyr Trp Leu Tyr Tyr Leu His Pro Met Val Gln Arg
195 200 205
Gln Gln Leu Asp Tyr Gly Ile Tyr Val Ile Asn Gln Ala Gly Glu Ser
210 215 220
Met Phe Asn Arg Ala Lys Leu Leu Asn Val Gly Phe Lys Glu Ala Leu
225 230 235 240
Lys Asp Tyr Asp Tyr Asn Cys Phe Val Phe Ser Asp Val Asp Leu Ile
245 250 255
Pro Met Asn Asp His Asn Thr Tyr Arg Cys Phe Ser Gln Pro Arg His
260 265 270
Ile Ser Val Ala Met Asp Lys Phe Gly Phe Ser Leu Pro Tyr Val Gln
275 280 285
Tyr Phe Gly Gly Val Ser Ala Leu Ser Lys Gln Gln Phe Leu Ser Ile
290 295 300
Asn Gly Phe Pro Asn Asn Tyr Trp Gly Trp Gly Gly Glu Asp Asp Asp
305 310 315 320
Ile Tyr Asn Arg Leu Ala Phe Arg Gly Met Ser Val Ser Arg Pro Asn
325 330 335
Ala Val Ile Gly Lys Cys Arg Met Ile Arg His Ser Arg Asp Lys Lys
340 345 350
Asn Glu Pro Asn Pro Gln Arg Phe Asp Arg Ile Ala His Thr Lys Glu
355 360 365

Thr Met Leu Ser Asp Gly Leu Asn Ser Leu Thr Tyr Met Val Leu Glu
370 375 380
Val Gln Arg Tyr Pro Leu Tyr Thr Lys Ile Thr Val Asp Ile Gly Thr
385 390 395 400
Pro Ser

<210> 7
<211> 113
<212> PRT
<213> Homo sapiens

<400> 7
Arg Asp Leu Ser Arg Leu Pro Gln Leu Val Gly Val Ser Thr Pro Leu
1 5 10 15
Gln Gly Gly Ser Asn Ser Ala Ala Ala Ile Gly Gln Ser Ser Gly Asp
20 25 30
Leu Arg Thr Gly Gly Ala Arg Pro Pro Pro Pro Leu Gly Ala Ser Ser
35 40 45
Gln Pro Arg Pro Gly Gly Asp Ser Ser Pro Val Val Asp Ser Gly Pro
50 55 60
Gly Pro Ala Ser Asn Leu Thr Ser Val Pro Val Pro His Thr Thr Ala
65 70 75 80
Leu Ser Leu Pro Ala Cys Pro Glu Glu Ser Pro Leu Leu Val Gly Pro
85 90 95
Met Leu Ile Glu Phe Asn Met Pro Val Asp Leu Glu Leu Val Ala Lys
100 105 110
Gln

<210> 8
<211> 85
<212> PRT
<213> Bos taurus

<400> 8
Arg Asp Leu Arg Arg Leu Pro Gln Leu Val Gly Val His Pro Pro Leu
1 5 10 15
Gln Gly Ser Ser His Gly Ala Ala Ala Ile Gly Gln Pro Ser Gly Glu
20 25 30
Leu Arg Leu Arg Gly Val Ala Pro Pro Pro Pro Leu Gln Asn Ser Ser
35 40 45

Lys Pro Arg Ser Arg Ala Pro Ser Asn Leu Asp Ala Tyr Ser His Pro
50 55 60
Gly Pro Gly Pro Gly Pro Gly Ser Asn Leu Thr Ser Ala Pro Val Pro
65 70 75 80
Ser Thr Thr Thr Arg
85

<210> 9
<211> 273
<212> PRT
<213> Homo sapiens

<400> 9
Ser Leu Pro Ala Cys Pro Glu Glu Ser Pro Leu Leu Val Gly Pro Met
1 5 10 15
Leu Ile Glu Phe Asn Met Pro Val Asp Leu Glu Leu Val Ala Lys Gln
20 25 30
Asn Pro Asn Val Lys Met Gly Gly Arg Tyr Ala Pro Arg Asp Cys Val
35 40 45
Ser Pro His Lys Val Ala Ile Ile Ile Pro Phe Arg Asn Arg Gln Glu
50 55 60
His Leu Lys Tyr Trp Leu Tyr Tyr Leu His Pro Val Leu Gln Arg Gln
65 70 75 80
Gln Leu Asp Tyr Gly Ile Tyr Val Ile Asn Gln Ala Gly Asp Thr Ile
85 90 95
Phe Asn Arg Ala Lys Leu Leu Asn Val Gly Phe Gln Glu Ala Leu Lys
100 105 110
Asp Tyr Asp Tyr Thr Cys Phe Val Phe Ser Asp Val Asp Leu Ile Pro
115 120 125
Met Asn Asp His Asn Ala Tyr Arg Cys Phe Ser Gln Pro Arg His Ile
130 135 140
Ser Val Ala Met Asp Lys Phe Gly Phe Ser Leu Pro Tyr Val Gln Tyr
145 150 155 160
Phe Gly Gly Val Ser Ala Ser Ser Lys Gln Gln Phe Leu Thr Ile Asn
165 170 175
Gly Phe Pro Asn Asn Tyr Trp Gly Trp Gly Gly Glu Asp Asp Asp Ile
180 185 190
Phe Asn Arg Leu Val Phe Arg Gly Met Ser Ile Ser Arg Pro Asn Ala
195 200 205
Val Val Gly Thr Cys Arg Met Ile Arg His Ser Arg Asp Lys Lys Asn
210 215 220

Glu Pro Asn Pro Gln Arg Phe Asp Arg Ile Ala His Thr Lys Glu Thr
225 230 235 240
Met Leu Ser Asp Gly Leu Asn Ser Leu Thr Tyr Gln Val Leu Asp Val
245 250 255
Gln Arg Tyr Pro Leu Tyr Thr Gln Ile Thr Val Asp Ile Gly Thr Pro
260 265 270
Ser

<210> 10
<211> 273
<212> PRT
<213> Bos taurus

<400> 10
Ser Leu Thr Ala Cys Pro Glu Glu Ser Pro Leu Leu Val Gly Pro Met
1 5 10 15
Leu Ile Glu Phe Asn Ile Pro Val Asp Leu Lys Leu Ile Glu Gln Gln
20 25 30
Asn Pro Lys Val Lys Leu Gly Gly Arg Tyr Thr Pro Met Asp Cys Ile
35 40 45
Ser Pro His Lys Val Ala Ile Ile Ile Leu Phe Arg Asn Arg Gln Glu
50 55 60
His Leu Lys Tyr Trp Leu Tyr Tyr Leu His Pro Met Val Gln Arg Gln
65 70 75 80
Gln Leu Asp Tyr Gly Ile Tyr Val Ile Asn Gln Ala Gly Glu Ser Met
85 90 95
Phe Asn Arg Ala Lys Leu Leu Asn Val Gly Phe Lys Glu Ala Leu Lys
100 105 110
Asp Tyr Asp Tyr Asn Cys Phe Val Phe Ser Asp Val Asp Leu Ile Pro
115 120 125
Met Asn Asp His Asn Thr Tyr Arg Cys Phe Ser Gln Pro Arg His Ile
130 135 140
Ser Val Ala Met Asp Lys Phe Gly Phe Ser Leu Pro Tyr Val Gln Tyr
145 150 155 160
Phe Gly Gly Val Ser Ala Leu Ser Lys Gln Gln Phe Leu Ser Ile Asn
165 170 175
Gly Phe Pro Asn Asn Tyr Trp Gly Trp Gly Gly Glu Asp Asp Asp Ile
180 185 190
Tyr Asn Arg Leu Ala Phe Arg Gly Met Ser Val Ser Arg Pro Asn Ala
195 200 205

Val Ile Gly Lys Cys Arg Met Ile Arg His Ser Arg Asp Lys Lys Asn
210 215 220
Glu Pro Asn Pro Gln Arg Phe Asp Arg Ile Ala His Thr Lys Glu Thr
225 230 235 240
Met Leu Ser Asp Gly Leu Asn Ser Leu Thr Tyr Met Val Leu Glu Val
245 250 255
Gln Arg Tyr Pro Leu Tyr Thr Lys Ile Thr Val Asp Ile Gly Thr Pro
260 265 270
Ser

<210> 11
<211> 1197
<212> PRT
<213> Homo sapiens

<400> 11
Ala Thr Gly Ala Gly Gly Cys Thr Thr Cys Gly Gly Gly Ala Gly Cys
1 5 10 15
Cys Gly Cys Thr Cys Cys Thr Gly Ala Gly Cys Cys Gly Gly Ala Gly
20 25 30
Cys Gly Cys Cys Gly Cys Gly Ala Thr Gly Cys Cys Ala Gly Gly Cys
35 40 45
Gly Cys Gly Thr Cys Cys Cys Thr Ala Cys Ala Gly Cys Gly Gly Gly
50 55 60
Cys Cys Thr Gly Cys Cys Gly Cys Cys Thr Gly Cys Thr Cys Gly Thr
65 70 75 80
Gly Gly Cys Cys Gly Thr Cys Thr Gly Cys Gly Cys Thr Cys Thr Gly
85 90 95
Cys Ala Cys Cys Thr Thr Gly Gly Cys Gly Thr Cys Ala Cys Cys Cys
100 105 110
Thr Cys Gly Thr Thr Thr Ala Cys Thr Ala Cys Cys Thr Gly Gly Cys
115 120 125
Thr Gly Gly Cys Cys Gly Cys Gly Ala Cys Cys Thr Gly Ala Gly Cys
130 135 140
Cys Gly Cys Cys Thr Gly Cys Cys Cys Cys Ala Ala Cys Thr Gly Gly
145 150 155 160
Thr Cys Gly Gly Ala Gly Thr Cys Thr Cys Cys Ala Cys Ala Cys Cys
165 170 175
Gly Cys Thr Gly Cys Ala Gly Gly Gly Cys Gly Gly Gly Thr Cys Gly
180 185 190

Ala Ala Cys Ala Gly Thr Gly Cys Cys Gly Cys Cys Gly Cys Cys Ala
195 200 205

Thr Cys Gly Gly Gly Cys Ala Gly Thr Cys Cys Thr Cys Cys Gly Gly
210 215 220

Gly Gly Ala Cys Cys Thr Cys Cys Gly Gly Ala Cys Cys Gly Gly Ala
225 230 235 240

Gly Gly Gly Gly Cys Cys Cys Gly Gly Cys Cys Gly Cys Cys Gly Cys
245 250 255

Cys Thr Cys Cys Thr Cys Thr Ala Gly Gly Cys Gly Cys Cys Thr Cys
260 265 270

Cys Thr Cys Cys Cys Ala Gly Cys Cys Gly Cys Gly Cys Cys Cys Gly
275 280 285

Gly Gly Thr Gly Gly Cys Gly Ala Cys Thr Cys Cys Ala Gly Cys Cys
290 295 300

Cys Ala Gly Thr Cys Gly Thr Gly Gly Ala Thr Thr Cys Thr Gly Gly
305 310 315 320

Cys Cys Cys Thr Gly Gly Cys Cys Cys Cys Gly Cys Thr Ala Gly Cys
325 330 335

Ala Ala Cys Thr Thr Gly Ala Cys Cys Thr Cys Gly Gly Thr Cys Cys
340 345 350

Cys Ala Gly Thr Gly Cys Cys Cys Cys Ala Cys Ala Cys Cys Ala Cys
355 360 365

Cys Gly Cys Ala Cys Thr Gly Thr Cys Gly Cys Thr Gly Cys Cys Cys
370 375 380

Gly Cys Cys Thr Gly Cys Cys Cys Thr Gly Ala Gly Gly Ala Gly Thr
385 390 395 400

Cys Cys Cys Cys Gly Cys Thr Gly Cys Thr Thr Gly Thr Gly Gly Gly
405 410 415

Cys Cys Cys Cys Ala Thr Gly Cys Thr Gly Ala Thr Thr Gly Ala Gly
420 425 430

Thr Thr Thr Ala Ala Cys Ala Thr Gly Cys Cys Thr Gly Thr Gly Gly
435 440 445

Ala Cys Cys Thr Gly Gly Ala Gly Cys Thr Cys Gly Thr Gly Gly Cys
450 455 460

Ala Ala Ala Gly Cys Ala Gly Ala Ala Cys Cys Cys Ala Ala Ala Thr
465 470 475 480

Gly Thr Gly Ala Ala Gly Ala Thr Gly Gly Gly Cys Gly Gly Cys Cys
485 490 495

Gly Cys Thr Ala Thr Gly Cys Cys Cys Cys Cys Ala Gly Gly Gly Ala
500 505 510

Cys Thr Gly Cys Gly Thr Cys Thr Cys Thr Cys Cys Thr Cys Ala Cys
515 520 525

Ala Ala Gly Gly Thr Gly Gly Cys Cys Ala Thr Cys Ala Thr Cys Ala
530 535 540
Thr Thr Cys Cys Ala Thr Thr Cys Cys Gly Cys Ala Ala Cys Cys Gly
545 550 555 560
Gly Cys Ala Gly Gly Ala Gly Cys Ala Cys Cys Thr Cys Ala Ala Gly
565 570 575
Thr Ala Cys Thr Gly Gly Cys Thr Ala Thr Ala Thr Thr Ala Thr Thr
580 585 590
Thr Gly Cys Ala Cys Cys Cys Ala Gly Thr Cys Cys Thr Gly Cys Ala
595 600 605
Gly Cys Gly Cys Cys Ala Gly Cys Ala Gly Cys Thr Gly Gly Ala Cys
610 615 620
Thr Ala Thr Gly Gly Cys Ala Thr Cys Thr Ala Thr Gly Thr Thr Ala
625 630 635 640
Thr Cys Ala Ala Cys Cys Ala Gly Gly Cys Gly Gly Gly Ala Gly Ala
645 650 655
Cys Ala Cys Thr Ala Thr Ala Thr Thr Cys Ala Ala Thr Cys Gly Thr
660 665 670
Gly Cys Thr Ala Ala Gly Cys Thr Cys Cys Thr Cys Ala Ala Thr Gly
675 680 685
Thr Thr Gly Gly Cys Thr Thr Thr Cys Ala Ala Gly Ala Ala Gly Cys
690 695 700
Cys Thr Thr Gly Ala Ala Gly Gly Ala Cys Thr Ala Thr Gly Ala Cys
705 710 715 720
Thr Ala Cys Ala Cys Cys Thr Gly Cys Thr Thr Thr Gly Thr Gly Thr
725 730 735
Thr Thr Ala Gly Thr Gly Ala Cys Gly Thr Gly Gly Ala Cys Cys Thr
740 745 750
Cys Ala Thr Thr Cys Cys Ala Ala Thr Gly Ala Ala Thr Gly Ala Thr
755 760 765
Cys Ala Thr Ala Ala Thr Gly Cys Gly Thr Ala Cys Ala Gly Gly Thr
770 775 780
Gly Thr Thr Thr Thr Thr Cys Ala Cys Ala Gly Cys Cys Ala Cys Gly
785 790 795 800
Gly Cys Ala Cys Ala Thr Thr Thr Cys Cys Gly Thr Thr Gly Cys Ala
805 810 815
Ala Thr Gly Gly Ala Thr Ala Ala Gly Thr Thr Thr Gly Gly Ala Thr
820 825 830
Thr Cys Ala Gly Cys Cys Thr Ala Cys Cys Thr Thr Ala Thr Gly Thr
835 840 845
Thr Cys Ala Gly Thr Ala Thr Thr Thr Thr Gly Gly Ala Gly Gly Thr
850 855 860

Gly Thr Cys Thr Cys Thr Gly Cys Thr Thr Cys Ala Ala Gly Thr Ala
865 870 875 880
Ala Ala Cys Ala Ala Cys Ala Gly Thr Thr Thr Cys Thr Ala Ala Cys
885 890 895
Cys Ala Thr Cys Ala Ala Thr Gly Gly Ala Thr Thr Thr Cys Cys Thr
900 905 910
Ala Ala Thr Ala Ala Thr Thr Ala Thr Thr Gly Gly Gly Gly Cys Thr
915 920 925
Gly Gly Gly Gly Ala Gly Gly Ala Gly Ala Ala Gly Ala Thr Gly Ala
930 935 940
Thr Gly Ala Cys Ala Thr Thr Thr Thr Thr Ala Ala Cys Ala Gly Ala
945 950 955 960
Thr Thr Ala Gly Thr Thr Thr Thr Thr Ala Gly Ala Gly Gly Cys Ala
965 970 975
Thr Gly Thr Cys Thr Ala Thr Ala Thr Cys Thr Cys Gly Cys Cys Cys
980 985 990
Ala Ala Ala Thr Gly Cys Thr Gly Thr Gly Gly Thr Cys Gly Gly Gly
995 1000 1005
Ala Cys Gly Thr Gly Thr Cys Gly Cys Ala Thr Gly Ala Thr Cys Cys
1010 1015 1020
Gly Cys Cys Ala Cys Thr Cys Ala Ala Gly Ala Gly Ala Cys Ala Ala
1025 1030 1035 1040
Gly Ala Ala Ala Ala Ala Thr Gly Ala Ala Cys Cys Cys Ala Ala Thr
1045 1050 1055
Cys Cys Thr Cys Ala Gly Ala Gly Gly Thr Thr Thr Gly Ala Cys Cys
1060 1065 1070
Gly Ala Ala Thr Thr Gly Cys Ala Cys Ala Cys Ala Cys Ala Ala Ala
1075 1080 1085
Gly Gly Ala Gly Ala Cys Ala Ala Thr Gly Cys Thr Cys Thr Cys Thr
1090 1095 1100
Gly Ala Thr Gly Gly Thr Thr Thr Gly Ala Ala Cys Thr Cys Ala Cys
1105 1110 1115 1120
Thr Cys Ala Cys Cys Thr Ala Cys Cys Ala Gly Gly Thr Gly Cys Thr
1125 1130 1135
Gly Gly Ala Thr Gly Thr Ala Cys Ala Gly Ala Gly Ala Thr Ala Cys
1140 1145 1150
Cys Cys Ala Thr Thr Gly Thr Ala Thr Ala Cys Cys Cys Ala Ala Ala
1155 1160 1165
Thr Cys Ala Cys Ala Gly Thr Gly Gly Ala Cys Ala Thr Cys Gly Gly
1170 1175 1180
Gly Ala Cys Ala Cys Cys Gly Ala Gly Cys Thr Ala Gly
1185 1190 1195

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<212> DNA
<213> Artificial Sequence

<220>
<223> A synthetic primer

<400> 12
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<210> 13
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> A synthetic primer

<400> 13
atcgggaaga cgcgtgagat ccgccactcg agagac 36